UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/767,190	01/30/2004	William Setter	119508-00102	4584

27557   7590   08/25/2009
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ART UNIT	PAPER NUMBER
3721	

MAIL DATE	DELIVERY MODE
08/25/2009	PAPER

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

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Ex parte WILLIAM SETTER and
VENIKATA RAMANA SRINIVASA HOGIRALA

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Appeal 2009-003239
Application 10/767,190
Technology Center 3700

_____

Decided: August 25, 2009

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Before LINDA E. HORNER, MICHAEL W. O'NEILL, and
FRED A SILVERBERG, *Administrative Patent Judges*.

HORNER, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

William Setter et al. (Appellants) seek our review under 35 U.S.C.
§ 134 of the Examiner's decision rejecting claims 1-26. We have
jurisdiction under 35 U.S.C. § 6(b) (2002).

SUMMARY OF DECISION

We REVERSE.

THE INVENTION

The Appellants' claimed invention is "a method and apparatus that determines a best mathematical expression for representing individual pulses generated by an impact tool and solving the expression to accurately control the torque being applied to a body." Spec. 1:6-9. Claims 1 and 11, reproduced below, are representative of the subject matter on appeal.

> 1. A method for determining the torque applied to a fastener comprising the steps of:
>
>> applying a torque pulse to a fastener;
>>
>> detecting a signal representing the time-amplitude waveform of the torque pulse;
>>
>> fitting an equation that approximates the time-amplitude waveform by selecting one mathematical expression from a set of mathematical expressions and selecting at least one parameter that describes the torque pulse from a set of parameters;
>>
>> processing the equation to determine the torque being applied to the fastener;
>>
>> comparing the torque to a pre-set torque objective; and
>>
>> applying a second torque pulse to the fastener if the torque is less than the pre-set torque objective.

11. A method for determining the torque applied to a fastener comprising the steps of:

applying a plurality of torque pulses to a fastener during a fastener tightening sequence, wherein the torque pulses have a duration and amplitude;

detecting a signal representing the time-amplitude waveform shapes of each of the torque pulses;

converting the signals into mathematical expressions representing each of the torque pulses, wherein each mathematical expressions is selected from a set of mathematical expressions and include parameters representing at least the amplitude and duration of the torque pulses;

processing the mathematical expressions to obtain the torque applied to the fastener during the torque pulses; and

terminating the fastener tightening sequence if the torque is approximately equal to a pre-set torque objective.

THE EVIDENCE

The Examiner relies upon the following evidence:

Giardino   US 6,311,789 B1   Nov. 6, 2001

THE REJECTIONS

The Appellants seek review of the following rejections by the Examiner:

1.   Rejection of claims 1-3, 7-13, and 17-23 under 35 U.S.C. § 102(b) as anticipated by Giardino.

2.   Rejection of claims 4-6, 14-16, and 24-26 under 35 U.S.C. § 103(a) as unpatentable over Giardino.

ISSUES

The Appellants contend that Giardino does not disclose fitting an equation that approximates torque by "selecting one mathematical expression from a set of mathematical expressions," as recited in claims 1 and 21.[1] App. Br. 6-12.

The Appellants also contend that Giardino does not disclose accounting for variations in threaded fastening operations and adjusting the equations accordingly, as called for in claim 11.[2] App. Br. 10.

The issues before us are:

Have the Appellants shown the Examiner erred in finding that Giardino discloses fitting an equation that approximates torque by "selecting one mathematical expression from a set of mathematical expressions?"

Have the Appellants shown the Examiner erred in finding that Giardino discloses accounting for variations in threaded fastening operations, and adjusting the equations accordingly?

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[1] The Appellants also contend that claim 11 contains the limitation of fitting an equation; however, claim 11 does not contain this limitation. App. Br. 10.

[2] The Appellants' Brief filed on December 3, 2007, contains an incorrect version of claim 11. The correct version of claim 11, which includes the language "selecting one mathematical expression from a set of mathematical expressions," is reproduced above and corresponds to the claims as amended on September 13, 2005.

FINDINGS OF FACT

We find that the following enumerated facts are supported by at least a preponderance of the evidence. *Ethicon, Inc. v. Quigg*, 849 F.2d 1422, 1427 (Fed. Cir. 1988) (explaining the general evidentiary standard for proceedings before the Office).

1. Giardino discloses a process for determining torque output and controlling impact tools using impulse. Giardino, col. 1, ll. 7-9.

2. Giardino discloses the process includes the two steps of "determining the impulse of a tool impact; and calculating a torque value of the tool from the impulse." Giardino, col. 1, ll. 59-61. More specifically, Giardino discloses that sensor 30 of power tool 10 measures impulse (the integration of the product of force and time over a desired time duration). Giardino, col. 3, ll. 59-62; col. 4, ll. 7-19; fig. 1. The torque (T) is then derived by multiplying the impulse (I) by the torque arm (r), and then dividing this product by the time duration (t), T=Ir/t. Giardino, col. 4, ll. 41-44.

3. Giardino discloses that prior to determination of the torque, the impulse value may be multiplied by a coefficient of proportionality C, a predetermined value based on the size of the particular tool (e.g. it may vary based on the area of the magnetic field and manufacturing tolerance). Giardino, col. 4, ll. 44-49.

4. Other than variation for the coefficient of proportionality, Giardino does not disclose selecting alternate torque computation methods. Giardino, *passim*.

PRINCIPLES OF LAW

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631 (Fed. Cir. 1987).

"Section 103 forbids issuance of a patent when 'the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.'" *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) where in evidence, so-called secondary considerations. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). *See also KSR*, 550 U.S. at 407 ("While the sequence of these questions might be reordered in any particular case, the [*Graham*] factors continue to define the inquiry that controls.")

ANALYSIS

Rejection of claims 1-3, 7-13, and 17-23 under 35 U.S.C. § 102(b) as anticipated by Giardino

Claims 1-3, 7-10, and 21-23

Independent claims 1 and 21 contain the limitation that the controller selects a mathematical expression from a set of mathematical expressions that approximates (fits) the waveform signal of the torque pulse. The

Appellants' Specification states that "the controller software executes a series of routines [to] fit a linear equation that approximates the torque pulse waveform (or it fits a number of different equations to find the best one)." Spec. 10:17-19. Giving claims 1 and 21 their broadest reasonable interpretation consistent with the Specification, a person of ordinary skill in the art would understand the claims to require selecting one mathematical expression from a plurality of mathematical expressions that approximates the waveform signal of the torque pulse. *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004)(During examination of a patent application, pending claims are given "their broadest reasonable interpretation consistent with the specification" and "in light of the specification as it would be interpreted by one of ordinary skill in the art.").

Giardino discloses a process for determining torque output and controlling impact tools that includes the steps of determining impulse and then calculating a torque value from the impulse (Facts 1, 2). Additionally, to account for varying tool sizes, the impulse value may be multiplied by a coefficient of proportionality (Fact 3). While Giardino discloses the use of different mathematical equations (by use of a different coefficient of proportionality) to calculate torque, selection is based upon differing tool sizes, and is not based on fitting the equation to the waveform of the torque pulse (Facts 2, 3, 4). Because Giardino does not disclose the controller selecting one mathematical expression from a plurality of mathematical expressions that approximates the waveform signal of the torque pulse, Giardino does not anticipate claims 1 and 21. Giardino also does not anticipate claims 2, 3, 7-10, 22, and 23, by virtue of their dependence from claims 1 and 21.

Claims 11-13, 17-20

Independent claim 11 is a method claim that includes the steps of applying a plurality of torque pulses to a fastener during a tightening sequence, detecting a signal for each pulse, converting each signal into a mathematical expression, processing the expressions to determine the torque applied, and terminating the tightening sequence if the torque is equal to a pre-set objective. We agree with the Appellants that by this process, the claimed method can account for variations in threaded fastening operations by selecting a mathematical expression from a set of mathematical equations for each torque pulse during each tightening sequence. App. Br. 9, Reply Br. 4.

In contrast, Giardino has one mathematical expression for determining torque for all torque pulses for a tightening sequence (Facts 1-4). Even though Giardino discloses that the coefficient of proportionality can change with a different sized tool (resulting in a different equation), for any given tool size, Giardino's method calculates torque by only one mathematical expression for a given tool and tightening sequence, and does not select a mathematical expression from a set of mathematical expressions for each torque pulse in a tightening sequence. For that reason, the Appellants are correct that Giardino's method, unlike the method of independent claim 11, does not account for variations in fastening operations. Therefore, Giardino does not anticipate claim 11. Giardino also does not anticipate claims 12, 13, and 17-20 by virtue of their dependence from claim 11.

Rejection of claims 4-6, 14-16, and 24-26 under 35 U.S.C. § 103(a) as unpatentable over Giardino

Claims 4-6 and 24-26

The obviousness rejection of claims 4-6 and 24-26 relies on the erroneous underlying finding that Giardino discloses selecting one mathematical expression from a plurality of mathematical expressions that approximates the waveform signal of the torque pulse, as called for in independent claims 1 and 21. As we concluded in the analysis of the rejection of claims 1 and 21 under 35 U.S.C. § 102(b) as anticipated by Giardino, *supra*, Giardino does not disclose selecting one mathematical expression from a plurality of mathematical expressions that approximates the waveform signal of the torque pulse. Further, the Examiner does not propose a modification that would remedy this deficiency in Giardino. Ans. 6-7. As such, the Appellants have demonstrated the Examiner erred in the rejection of claims 4-6 and 24-26.

Claims 14-16

The obviousness rejection of claims 14-16 relies on the erroneous underlying finding that Giardino discloses a method that accounts for variations in fastening operations and adjusts the equations accordingly. As we concluded in the analysis of claim 11 under 35 U.S.C. § 102(b) as anticipated by Giardino, *supra*, Giardino does not disclose a method that accounts for variations in fastening operations and adjusts the equations accordingly. Further, the Examiner does not propose a modification that would remedy this deficiency in Giardino. Ans. 6-7. As such, the Appellants have demonstrated the Examiner erred in the rejection of claims 14-16.

CONCLUSIONS

The Appellants have shown the Examiner erred in finding that Giardino discloses fitting an equation that approximates torque by "selecting one mathematical expression from a set of mathematical expressions."

The Appellants have shown the Examiner erred in finding that Giardino discloses accounting for variations in threaded fastening operations and adjusting the equations accordingly.

DECISION

We REVERSE the decision of the Examiner to reject claims 1-26.

REVERSED

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